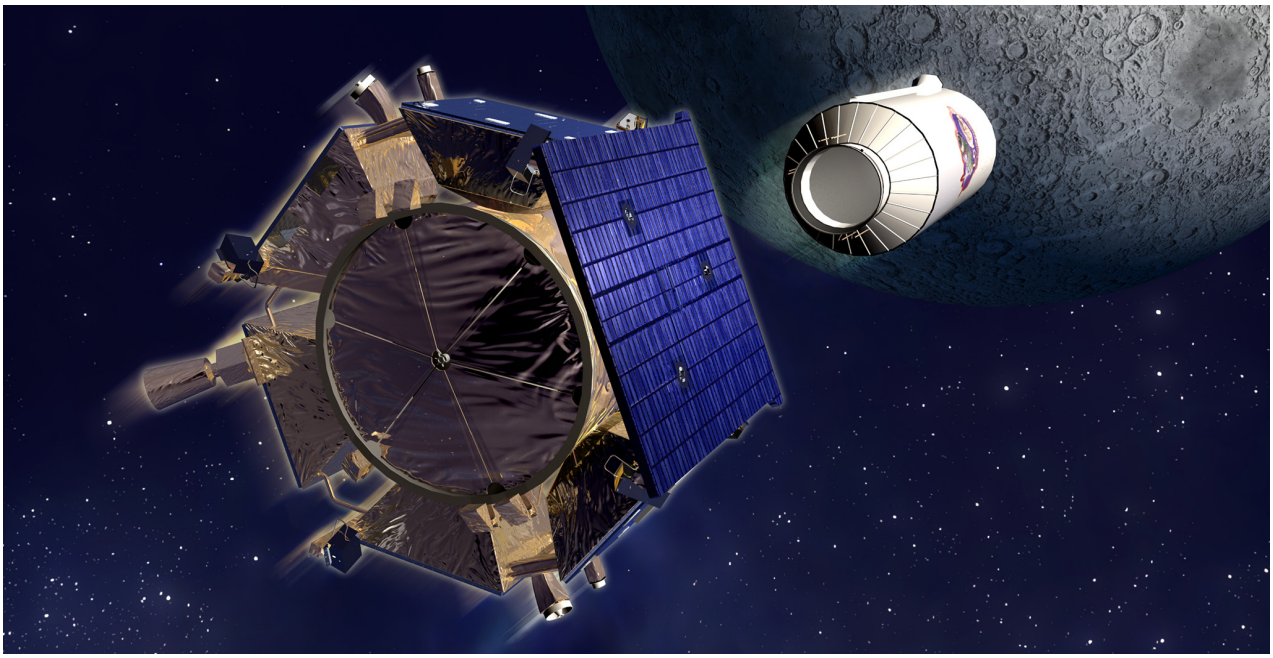
National Aeronautics and Space Administration

# LCROSS

## Lunar CRater Observation and Sensing Satellite

NASAfacts



**Lunar Mystery**

Earth's closest neighbor is holding a secret. In 1999, hints of that secret were revealed in the form of concentrated hydrogen signatures detected in permanently shadowed craters at the lunar poles by NASA's Lunar Prospector. These readings may be an indication of lunar water-ice and could have far-reaching implications as humans expand exploration beyond low-Earth orbit. The Lunar CRater Observing and Sensing Satellite (LCROSS) mission is seeking a definitive answer.

**Mission Profile**

In April 2006, NASA selected the LCROSS proposal for a low-cost, fast-track companion mission to the Lunar Reconnaissance Orbiter (LRO). The main LCROSS mission objective is to confirm the presence or absence of water ice in a permanently shadowed crater near a lunar pole.

LCROSS is scheduled to launch with the Lunar Reconnaissance Orbiter aboard an Atlas V rocket from Cape Canaveral, Fla., in 2009. After launch, the LCROSS shepherding spacecraft and the Atlas V's Centaur upper stage rocket will execute a fly-by of the moon and enter into an elongated Earth orbit to position LCROSS for impact near a lunar pole. On final approach, the shepherding spacecraft and Centaur will separate. The Centaur will become an impactor that will create a debris plume that will rise above the lunar surface. Following four minutes behind, the shepherding spacecraft will fly through the debris plume, collecting and relaying data back to Earth before impacting the lunar surface and creating a second debris plume.

The debris plumes are expected to be visible from Earth- and space-based telescopes 10-to-12 inches and larger.

**Why LCROSS?**

Just like on Earth, water will be a crucial resource on the moon. Transporting water and other goods from Earth to the moon's surface is expensive. Finding natural resources, such as water ice, on the moon could help expedite lunar exploration. The LCROSS mission will search for water, using information learned from the Clementine and Lunar Prospector missions.

By going to the moon, a new generation of explorers will learn how to work safely in a harsh environment. The moon is a stepping stone to future exploration of other bodies in our solar system and offers many clues about when the Earth and the other planets were formed.

***Images right and below**: Payload scientist Kimberly Ennico (sitting) and software engineer, Mark Shirley (standing) perform system checks on the nine science instuments in the Lunar CRater Observation and Sensing Satellite instument payload in the clean-room facility at Northrop Grumman in Redondo Beach, Calif. The payload includes a visible camera, four near-infrared and mid-infrared cameras, two near-infrared spectrometers, a visible spectrometer and a visible radiometer to measure the flash of light created by the Centaur impact. Credit: NASA/Northrop Grumman.*

**LCROSS Science Payload**
The LCROSS science payload consists of two near-infrared spectrometers, a visible light spectrometer, two mid-infrared cameras, two near-infrared cameras, a visible camera and a visible radiometer. The LCROSS instruments were selected to provide mission scientists with multiple complimentary views of the debris plume created by the Centaur impact.

As the ejecta rises above the target crater's rim and is exposed to sunlight, any water-ice, hydrocarbons or organics will vaporize and break down into their basic components. These components primarily will be monitored by the visible and infrared spectrometers. The near-infrared and mid-infrared cameras will determine the total amount and distribution of water in the debris plume. The spacecraft's visible camera will track the impact location and the behavior of the debris plume while the visible radiometer will measure the flash created by the Centaur impact.

**LCROSS Mission Team**
NASA's Ames Research Center, Moffett Field, Calif., is overseeing the development of the LCROSS mission with its spacecraft and integration partner, Northrop Grumman, Redondo Beach, Calif. LCROSS is a fast-paced, low-cost, mission that will leverage existing NASA systems, commercial-off-the-shelf components, the spacecraft expertise of Northrop Grumman and experience gained during the Lunar Prospector Mission in 1999. Ames is managing the mission, conducting mission operations, and developing the payload instruments. Northrop Grumman Aerospace Systems designed and is built the spacecraft for this innovative mission. Ames mission scientists will spearhead the data analysis.

**Lunar Precursor Robotic Program**
The LCROSS and LRO missions are components of the Lunar Precursor Robotic Program program at NASA's Marshall Space Flight Center, Hunstsville, Ala. The program manages pathfinding robotic missions to the moon for the Exploration Systems Mission Directorate at NASA Headquarters in Washington. These precursor missions will provide data for lunar mapping and modeling for human exploration. The Lunar Precursor Robotic Program is responsible for the management, technology planning, systems assessment, flight assurance and public outreach.

For more information about the Lunar CRater Observation and Sensing Satellite Mission visit:

**http:// www.nasa.gov/lcross**
**http:// lcross.arc.nasa.gov**

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